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ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

**Treatment Height for Mountain Pine Beetles
in Front Range Ponderosa Pine**

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W. F. McCambridge

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Pitch tubes and intermittent blue stain are generally found about 5 feet above the highest point where significant mountain pine beetle brood is produced; thus, chemical control can be achieved by spraying to 5 feet below the highest pitch tubes.

Keywords: *Dendroctonus ponderosae*, *Pinus ponderosa*, ethylene dibromide.

The Problem

Ponderosa pine trees infested by mountain pine beetles (*Dendroctonus ponderosae* Hopkins) are commonly felled and sprayed with ethylene dibromide during control programs in Colorado. Once an infested tree is on the ground, a decision must be made as to how much of it should be sprayed. One of four guidelines is frequently used: (1) Spray to a pre-set top diameter — for example, a 4-inch

minimum; (2) spray to the highest pitch tube, plus 2 feet; (3) spray to the height of blue stain visible in the xylem; and (4) spray to the height of brood determined by bark examinations.

Control crews recognize certain shortcomings in these guides. Some of the more serious are: (1) Mountain pine beetles attack to no fixed upper diameter. Top diameter of infestation is variable from year to year and tree to tree of similar size. Setting a small upper diameter limit might result in considerable overspraying. (2) Spraying beyond the highest pitch tubes wastes insecticide and unnecessarily kills parasitic and predaceous insects attacking secondary beetles under thin bark. Some of these

¹Entomologist, Rocky Mountain Forest and Range Experiment Station, with central headquarters maintained at Fort Collins, in cooperation with Colorado State University.

insects also attack mountain pine beetles. (3) Ips beetles also carry blue stain fungi, and frequently infest the upper portions of trees infested by mountain pine beetles. Blue stain near the upper limit of mountain pine beetle infestation occurs in sparse and isolated strips. (4) Brood at its upper limit is often found in strips and is very sparse. Treating to the height of blue stain or brood is overtreating, is time consuming because both are difficult to find, and is costly. A better guideline is needed.

The Data

Seventy-two trees infested with mountain pine beetles were climbed in June 1971 and examined for brood in relation to (1) height along the tree, (2) presence of pitch tubes, and (3) blue stain. The trees were examined in groups as found. The groups were scattered over the northern part of the Roosevelt National Forest near Fort Collins, Colorado.

Characteristics of the average infested tree were as follows:

Diameter (inches):	
At breast height	10.4
At maximum height of brood	8.0
Maximum height (feet):	
Of pitch tubes	24.3
Of brood	<u>18.7</u>
Difference	5.6
Standard deviation	2.4

Further analysis of these data show that, on the average, 75 percent of trees sampled will have pitch tubes at least 4 feet higher than the highest brood. There is an additional foot where brood is of little consequence.

Live brood (mostly adults and a few pupae) were taken from two 6- by 6-inch bark samples at each interval on each of the 72 trees. A good idea of how much brood is found near the upper limits of brood (not pitch tubes, which on the average are another 5.6 feet higher) is as follows:

Distance down from upper limit of brood (feet)	Brood per square foot (number)	Sprayed under this guide
0	1.6	
1	4.0	
2	14.4	
3	14.8	
4	25.2	
5	30.0	

Discussion

Treating trees to within 5 feet of the highest pitch tubes will prevent overtreatment and save money. The money saved will be directly proportional to the amount of insecticide saved and the cost of labor for spraying once the tree is cut and limbed. In our average tree (10.4 inches d.b.h. with Girard form class 76), the area between the highest pitch tubes (and scattered blue stain) and the highest brood is 18.8 percent of the bark area attacked by beetles. By reducing spray height the reduction in sprayed area will save about 39¢ (= 5 percent of total cost) per tree.² This calculation is conservative since the branches in the upper infested bole require a disproportionate amount of effort for limbing. As trees get larger, the percent of bark area which does not need spraying gets smaller. For example, if the average infested tree is 11.5 inches d.b.h., the area omitted from spray is 16.2 percent of the bark showing evidence of attack. This latter mean diameter is very realistic for infested ponderosa pines in Colorado, and in the Black Hills of South Dakota.

There is little need for concern that the few beetles escaping from unsprayed tops will continue the infestation. Their numbers, even collectively, will be relatively small. Repeated observations of control operations reveal unsprayed groups of trees within and adjacent to control areas are, by far, the chief contributors to continuance of beetle epidemics.

² Based on 1971 control cost breakdowns furnished by Colorado State Forest Service. Average cost/tree for chemical was \$1.35, and 15 percent of labor cost/tree was spent applying insecticide. (Total labor cost/tree = \$5.42.)